5.8/7 $f(x)=\frac{1}{2}x-x^{\frac{1}{2}}$ $[0,4]$

$f'(x)=\frac{1}{2}-\frac{1}{2}x^{-\frac{1}{2}}$

$=\frac{1}{2}-\frac{1}{2\sqrt{x}}$

$f(4)=\frac{1}{2}(4)-4^{1/2}$

$=2-2=0$

$f(0)=\frac{1}{2}(0)-0^{\frac{1}{2}}=0$

$\frac{f(4)-f(0)}{4-0}=\frac{0-0}{4}=\boxed{0}$

$\cancel{f}$

$f'(x)=\left(\frac{1}{2}-\frac{1}{2\sqrt{x}}\right)\frac{2\sqrt{x}}{1}=\left(\boxed{0}\right)\frac{2\sqrt{x}}{1}$ mult by $2\sqrt{x}$

$\Rightarrow x^{\frac{1}{2}}-1=0$

$x^{\frac{1}{2}}=1$

$x=1$

$c=1$ is in $[0,4]$ and has a tangent line of slope 0

[and the secant line has slope 0]

Note:

$x^{\frac{1}{2}}\cdot x^{1}=x^{\frac{1}{2}+1}=x^{\frac{1}{2}+\frac{2}{2}}=x^{\frac{1+2}{2}}=x^{\frac{3}{2}}$

MVT: $\exists\, c$ such that

$$f'(c) = \frac{f(b)-f(a)}{b-a}$$

Rolle's Theorem: MVT, but when

$$\frac{f(b)-f(a)}{b-a} = 0$$

HW $\rightarrow$ prove Rolle's Theorem

$\Rightarrow$ use Rolle's Theorem to prove MVT

Dec 4-7:30 AM

5.8/8

$f(x) = \frac{1}{x^2} - \frac{4}{3x} + \frac{1}{3}$; $[1, 3]$

x^{-2} x^{-1}

$f'(x) = -2x^{-3} - \frac{4}{3}(-x^{-2})$

$= \frac{-2}{x^3} + \frac{4}{3x^2}$

$f'(x) = \left(-\frac{2}{x^3} + \frac{4}{3x^2} = 0\right)x^3$

$\Rightarrow -2 + \frac{4}{3}x = 0$

so $\frac{4}{3}x = 2$; $x = 2 \cdot \frac{3}{4}$

$x = \frac{3}{2}$

$f(3) = \frac{1}{9} - \frac{4}{9} + \frac{3}{9} = 0$

$f(1) = \frac{1}{1} - \frac{4}{3} + \frac{1}{3} = 0$

$\frac{f(3) - f(1)}{3-1} = \frac{0}{2} = 0$

OR

$\frac{4}{3x^2} = \frac{2}{x^3}$

so $6x^2 = 4x^3$; $6x^2 - 4x^3 = 0$

$2x^2(3 - 2x) = 0$

$3 = 2x$; $x = \frac{3}{2}$

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1998 AB 90

$\frac{db}{dt} = +3$; $\frac{dh}{dt} = -3$

$\rightarrow A = \frac{1}{2} bh$

A is increasing when

$\rightarrow \frac{dA}{dt} = \frac{1}{2}\left(\frac{db}{dt}h + b\frac{dh}{dt}\right)$

$\frac{dA}{dt} > 0$

so $\frac{dA}{dt} = \frac{1}{2}(3h - 3b)$ So

$3h - 3b > 0$

or $h > b$

1998 AB 9])

I. at least 2 zeros ✓

II. graph has at least 1 horizontal tangent.

A: MVT on [2,9] OR EVT on [2,9]

III. for some c, $2<c<5$, $f(c)=3$

IVT

$f(2)=-5$

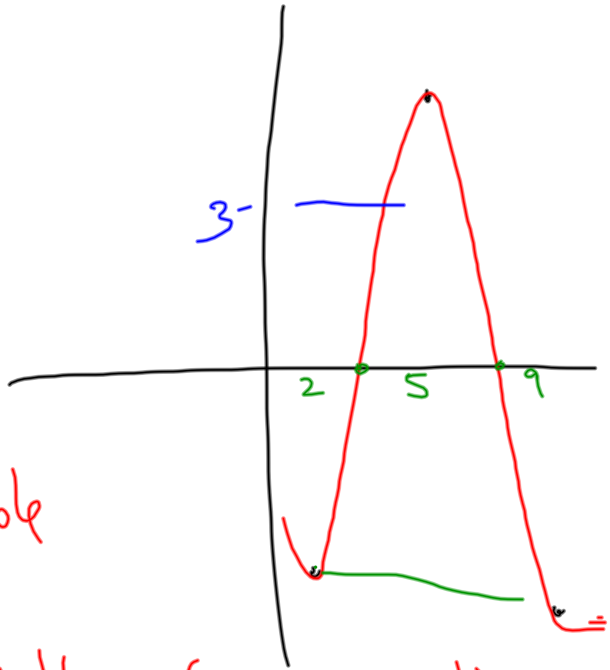
$f(5)=+5$

$f(9)=-5$

f is differentiable

we "KNOW" . . .

a function being differentiable ⇒ function is continuous



Dec 4-8:36 AM

Section IA: MC, No Calculator, 28 quest, 55 min

IB: MC, CALCULATOR, 17 quest, 50 min

Section IIA: free response, 2 questions, CALCULATOR
30 minutes
9 points each

IIB: free response, 4 questions, No Calculator
60 minutes
9 points each

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